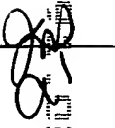


ELECTRONIC TIMEPIECE INCLUDING A TIME
RELATED DATA ITEM BASED ON A DECIMAL SYSTEM

The present invention relates to an electronic timepiece allowing the display of several time related data. More particularly, the present invention relates to a timepiece allowing the display of at least a first and a second time related data item, the first time related data item being based on the Hour-Minute-Second system

5 (hereinafter H-M-S).

Electronic timepieces allowing the display of a plurality of time related data are already known in the prior art. These timepieces, commonly called « universal timepieces » are typically provided to allow the display of a time related data item representative of a universal time and one or more time related data representative of
10 local times corresponding to different time zones. This multitude of time related data can cause a risk of confusion for the user when they are read and generally requires means to be provided to allow clear identification of what each of the displayed time data refers to.

 US Patent No. 4 926 400 describes an electronic timepiece in accordance with
15 the preamble part of independent claim 1. This timepiece allows the display of a first time related data item based on the H-M-S system and of a second time related data item based on a non-decimal system in which time is divided into twenty-five 25ths of a day. In accordance with table 1, column 3, of this document, one day (24 hours) is divided into 25 "hours" of 60 "minutes" each, each "minute" including 57.6 seconds.
20 Every "minute", 2.4 seconds are thus "saved" so as to form an additional simulated hour. The display modes of the "24h" and "25h" time related data items are identical. Without any complementary indications, the user of such a timepiece will not be able to clearly differentiate between these two time related data items.

One object of the present invention is thus to provide an electronic timepiece
25 allowing the display of at least a first and a second time related data item, by means of which the user can clearly and quickly identify and differentiate between the displayed time related data.

The present invention therefore concerns an electronic timepiece allowing the display of at least a first and a second time related data item the features of which are recited in independent claim 1.

The solution advocated by the present invention thus allow the first time related
5 data item to be clearly differentiated from the second due to the fact that the first and second time related data items are based on different systems.

The H-M-S system conventionally used consists of dividing the day into 24 hours, 1 hour being divided into 60 minutes, and 1 minute into 60 seconds. A time division based on the decimal system on the other hand consists in dividing the day,
10 not in accordance with the aforementioned conventional scheme, but successively, into tenths of a day (equivalent to 2.4 hours or 144 minutes), which are themselves divided into hundredths of a day (equivalent to 14.4 minutes or 864 seconds), then into thousandths of a day (equivalent to 86.4 seconds) etc..

In particular, by selecting a division of time into thousandths of a day, the
15 second time related data item only requires three digits (« 000 » to « 999 ») to be displayed and is thus clearly distinguished from a conventional time related data item based on the H-M-S system typically displayed in the format « HH:MM ». The risk of confusion during reading of the time related data is thus greatly reduced.

The atypical format of the second time related data item proves for example
20 particularly suitable for displaying a universal time to which the user can clearly refer without confusing it with a conventional time related data item relating to the time zone in which he is situated.

The decimal system further constitutes an advantageous alternative to the H-M-S system conventionally used since it allows the inherent conversion problems of
25 the H-M-S system to be avoided. This alternative is moreover more logical and comprehensible for the user who is already accustomed to the decimal system.

It is to be pointed out that patent application GB-A-2 274 004 and the article "Time and Its Units" of Mr. T. Raja Rao, "JOURNAL OF THE INSTITUTION OF ENGINEERS (INDIA) INDUSTRIAL DEVELOPMENT AND GENERAL
30 ENGINEERING", vol. 54, September 1973, pages 25-28, (XP-002101432), both describe the use of a decimal system as an alternative to the conventional H-M-S

system as well as a timepiece allowing a single time indication data item based on such a decimal system to be displayed.

In order to form a time related data item based on the H-M-S system, electronic timepieces commonly include a time base, typically a quartz oscillator
5 supplying pulses at a determined frequency equivalent to a binary power, for example 32,768 Hz. A frequency divider circuit, formed of a succession of N binary division stages (flip-flops) connected in cascade, is coupled to the time base so as to supply control pulses whose frequency is reduced by a factor 2^N . Typically, this frequency divider circuit is formed of N=15 binary division stages, so that the frequency of the
10 pulses supplied by the time base is reduced to 1 Hz. In electronic timepieces allowing the display of several distinct time related data, these control pulses are thus used to control the respective displays of these time related data.

In order to form the second time related data item based on the selected decimal system, it is a priori possible to periodically perform an arithmetical conversion
15 operation on a conventional time related data item based on the H-M-S system. This trivial solution consists, in other words, in providing conversion or calculating means dedicated to this task. It will be noted however that this solution is not suitable for use in a timepiece since it will preferably be sought to provide means allowing control pulses, which allow the second time related data item based on the decimal system to
20 be formed and displayed, to be generated directly.

In order to generate control pulses allowing a time related data item based on the decimal system to be formed in which the time is divided at least into thousandths of a day, it is necessary to generate such pulses at least at a frequency of 1/86.4 Hz or a decimal multiple of this frequency, i.e. 1/8.64 Hz for a division into ten-
25 thousandths of a day, 1/0.864 Hz for a division into a hundred-thousandths of a day,

etc.. In practice, one will choose to generate the second control pulses either at a frequency of 1/86.4 Hz or at a frequency of 1/8.64 Hz, higher frequencies being however able to be chosen as required.

5 A trivial solution to this problem consists in providing an additional time base
allowing pulses to be supplied at a specific frequency corresponding to a multiple of
the desired frequency, for example 10,000 Hz. A frequency divider circuit having for
example a division ratio equivalent to 86,400 would thus allow control pulses to be
generated at a frequency of 1/8.64 Hz. This trivial solution thus involves the use of two
distinct division chains (time base + frequency divider circuit) to display the first and
10 second time related data items. It will however be sought to limit the number of
components necessary to generate the control pulses and in particular to use only one
time base, and preferably a horological time base, i.e. a time base supplying pulses at
a frequency equivalent to a binary power.

Means for generating clock pulses which might be used within the scope of the
15 present invention are for example disclosed in documents US-A-3 975 898,
US-A-5 771 180, US-A-3 777 471 and US-A-3 284 715.

According to the present invention, the timepiece is advantageously arranged
to derive the control pulses of the first and second time related data items from the
same time base. It includes for this purpose generating means arranged to supply,
20 from auxiliary control pulses originating from the time base, the second control pulses
allowing the second time related data item to be formed and displayed. The timepiece
can thus be arranged in particular to derive, from pulses at 1 Hz originating from the
time base at the output of the frequency divider circuit, second control pulses having a
frequency of 1/86.4 Hz in order to form a second time related data item to a
25 thousandth of a day, despite the fact that the division ratio of these frequencies is not
integer.

Another advantage of the present invention thus lies in the fact that only one
time base is used to generate the different control pulses of the first and second time
related data items and that it is consequently possible to adapt the electronic system

of a conventional timepiece so that it allows the display of a time related data item based on the decimal system.

Other features and advantages of the present invention will appear upon reading the following detailed description, made with reference to the annexed
5 drawings given solely by way of example and in which:

- Figure 1 shows a simplified block diagram of a timepiece constituting a first embodiment of the present invention;

- Figure 2 shows a simplified block diagram of a timepiece constituting a second embodiment of the present invention;

10 - Figures 3a and 3b show plane view of timepieces according to the present invention illustrating different possibilities for the display of the time related data;

- Figure 4 shows a flow chart of the implementation of a first alternative embodiment of the generating means allowing control pulses to be supplied for the display of the time related data item based on the decimal system;

15 - Figure 5 shows a second alternative embodiment of the generating means allowing control pulses to be supplied for the display of the time related data item based on the decimal system;